

Claims:

1. A method for producing a hard mask in a capacitor device comprising the steps of:
 - applying a photosensitive sol-gel layer to said capacitor device;
 - applying a pattern to said sol-gel layer to form a patterned layer;
 - and
 - applying a thermal decomposition treatment to said patterned layer to convert it to a hard mask layer.
2. A method according to claim 1, further comprising the step of etching said hard mask layer according to said pattern to provide a pattern for the etching of one or more layers in said capacitor device.
3. A method according to claim 1, wherein the step of applying said photosensitive sol-gel layer comprises applying a titanium organic gel layer.
4. A method according to claim 1, wherein the step of applying said photosensitive sol-gel layer comprises applying a titanium-aluminium organic gel layer.
5. A method according to claim 1, wherein the step of applying said photosensitive sol-gel layer comprises applying a mixture of one or more titanium alkoxides with ethyl acetoactate (EacAc).
6. A method according to claim 5, wherein the step of applying said photosensitive sol-gel layer comprises applying a mixture of one or more of $(\text{TiOEt})_4$ or $\text{Ti}(\text{OEt})_4$ plus $\text{Al}(\text{OBu})_3$ with ethyl acetoactate (EacAc).
7. A method according to claim 1, wherein the step of applying a pattern comprises applying said pattern using a photolithographic process.

8. A method according to claim 1, wherein the step of applying a thermal decomposition treatment comprises applying an oxygen thermal decomposition treatment to convert said patterned layer to a hard mask material.

9. A method according to claim 8, wherein the step of applying a thermal decomposition treatment comprises applying an oxygen thermal decomposition treatment to convert said patterned layer to a TiO₂ hard mask material.

10. A method according to claim 8, wherein the step of applying a thermal decomposition treatment comprises applying an oxygen thermal decomposition treatment to convert said patterned layer to a Ti-Al-O hard mask material.

11. A method according to claim 1, wherein the step of applying a thermal decomposition treatment comprises applying a nitrogen thermal decomposition treatment to convert said patterned layer to a hard mask material.

12. A method according to claim 11, wherein the step of applying a thermal decomposition treatment comprises applying a nitrogen thermal decomposition treatment to convert said patterned layer to a TiN hard mask material.

13. A method according to claim 11, wherein the step of applying a thermal decomposition treatment comprises applying a nitrogen thermal decomposition treatment to convert said patterned layer to an Al-Ti-N hard mask material.

14. A method according to claim 1, wherein the step of applying said photosensitive organic gel layer comprises applying said layer using a spin coating technique.

15. A ferroelectric capacitor device etched according to the hard mask formed according to the method of claim 1.
16. An FeRAM device etched according to the hard mask formed according to the method of claim 1.
17. A hard mask formed according to the method of claim 1.